

## WEIGHT CHANGES OF THE COMMON DORMOUSE (*Muscardinus avellanarius* L.) DURING THE YEAR IN LITHUANIA

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**ABSTRACT.** More than 5000 *Muscardinus avellanarius* were weighed during investigations carried out in Lithuania in 1981–1999. Weights of dormice changed continually during the year. The steadiest average weight of adult males was in May – July (between 17.0 g to 17.9 g), before hibernation it increased to 29.8 g. Weight dynamics of females had some different features connected with reproduction. The weight of juveniles depended on the time of their birth. The maximum weight registered in Lithuania before hibernation was: in adult males – 42.8 g, in adult females – 35.0 g, in juveniles – 33.5 g. During hibernation *M. avellanarius* lost on average 33% of their maximum autumnal weight. In autumn before hibernation *M. avellanarius* weights may be higher in populations in the north of its range than in populations in the south. The use of weight to determine the age of *M. avellanarius* is very limited because the weights of separate age groups overlap in many cases.

**Key words:** *Muscardinus avellanarius*, weight dynamics, demographic groups, age determination, Lithuania

## LITVANYA FINDIK FARELERİNDE (*Muscardinus avellanarius* L.) YIL BOYUNCA GÖRÜLEN AĞIRLIK DEĞİŞİMLERİ

**ÖZET.** 1981-1999 yılları arasında Litvanya’da sürdürülen araştırmalarda 5000 ‘den fazla *Muscardinus avellanarius* ağırlıkları tartılmıştır. Fındık farelerinin ağırlıklarında yıl boyunca sürekli değişir. Ergin erkeklerdeki en istikrarlı ağırlık Mayıs-Temmuz ayları içindedir (17,0 g - 17,9 g arasında) , kış uykusuna kadar bu ağırlık 29,8 g’a kadar yükselir. Dişilerin ağırlık dinamikleri ise üremeye bağlı olan farklı özellikler gösterir. Kış uykusundan önce Litvanya’da kaydedilen maksimum ağırlık :ergin erkeklerde –42,8 g , ergin dişilerde – 35,0 g , gençlerde ise – 33,0 g ‘dır. *M. avellanarius* kış uykusu süresince maksimum sonbahar ağırlığının %33 ' nü kaybeder. Yayılış alanının kuzeyindeki popülasyonlarında kış uykusu öncesi sonbahar ağırlıkları güneydeki popülasyonlara oranla daha yüksektir. *M. avellanarius*’ da ağırlıkları kullanarak yaş tayini yapmak farklı yaş gruplarının ağırlık değerlerinin çoğu durumda çakışması nedeniyle oldukça sınırlıdır.

**Anahtar sözcükler:** *Muscardinus avellanarius*, ağırlık dinamikleri, demografik gruplar, yaş tayini, Litvanya

## INTRODUCTION

Common dormice (*Muscardinus avellanarius* L.) spend winter in hibernation in almost all their distribution area. Fat reserves are accumulated for this, and the weight of animals changes during the year. Until now this process has been analysed only in some parts of the *M. avellanarius* distribution area: Tula and Moscow regions (Likhachev, 1967), Switzerland (Catzefflis, 1983), Germany (Bangura, 1988; Büchner, 1998; Schulze, 1973). In other papers on *M. avellanarius* biology (Gaisler et al., 1977; Sidorowich, 1959 etc.) only a little data on their weight are presented.

During long-term investigations of two *M. avellanarius* populations carried out in Lithuania more than 5000 dormice were weighed. In many cases the exact age of dormice weighed was known. The aims of this paper are: 1) to present weight dynamics of separate *M. avellanarius* demographic groups during the active season; 2) to investigate weight as a possible determinant of age in *M. avellanarius*; 3) to compare the weight of *M. avellanarius* in Lithuania with weights from populations in other parts of its distribution.

## MATERIAL AND METHODS

Information on weight of *M. avellanarius* was collected in two locations: south-west Lithuania (Šakiai district) in 1981–1990 also in 1997–1999 and east Lithuania (Moletai district) in 1984–1993 during investigations of two populations (Juškaitis, 1994, 1997a, 1999a, b etc.). All dormice caught in nestboxes were weighed, marked with rings, and their sex and age determined. Dormice were considered adults if they had survived at least one hibernation. Three main age groups of juveniles were distinguished according to the time of their birth: 1) juveniles born in May – June, 2) juveniles born in July and 3) juveniles born in August – September. Only weights of juveniles marked in litters were used for analysis of juvenile weight dynamics. Weights of dormice in the first half of October and weights of the same marked individuals after hibernation (for males in April and for females in April – early May) were used for estimation of weight loss during hibernation.

A total of 2691 weights of *M. avellanarius* whose exact age was known were used for the analysis of weight dynamics.

## RESULTS AND DISCUSSION

### Weight dynamics in separate demographic groups

In Lithuania, *M. avellanarius* awoke from hibernation in April – early May. In early springs they can be found in nestboxes already in the first days of April. Males wake up from hibernation earlier than females: in April as many as 88% of all dormice detected in nestboxes were adult males (Juškaitis, 1997b). The average weight of males was rather high: males found in nestboxes in the first half of April weighed on average 20.4 g (n = 15). Thus, the majority of males awoke from hibernation with non-exhausted fat reserves. Maximum registered weight of males after hibernation was 25.3 g (three-year-old male on 28 April, 1988).

The average weight of males decreased gradually during April and May (Fig. 1) and reached its minimum in the first half of June (17.0 g, n = 68). During May – July the average weight of males was very consistent, only fluctuating between 17.0 g to 17.9 g. The increase in weight began in August and reached a maximum before hibernation in early October (29.8 g, n = 33). The fastest increase of weight was observed in late August and early September: an average of 4.5 g gained during two weeks. Many adult males weighed more than 30 g before hibernation, and the maximum weight was registered on 11 September 1988: a three-year-old male weighed 42.8 g. It is noteworthy that this was the only registered weight above 40 g. However a total of 10 cases were registered when adult males reached or exceeded 37 g.

Weight dynamics of females had some different features (Fig. 1). The majority of females usually awoke from hibernation later than males, in early May, with an average weight of 16.0 g (n = 136). They had evidently exhausted their fat reserves. Some females were found in nestboxes also in late April with average weight of only 15.0 g (n = 24). As a rule, the majority of these animals had been born in late litters in the previous year, and lack of fat reserves could be a reason of their earlier waking up. Two slight peaks observed in the weight dynamics curve of females – in early June and early August – were connected with pregnancy (Juškaitis, 1997c). Female weight gain began in late August and reached an average of 27.0 g (n = 39) in early October. However average weights of females were 3 g less than average weights of males during September and early October ( $t = 3.20 - 6.34$ ;  $p = 0.000 - 0.002$ ) (Fig. 1). The heaviest female caught in Lithuania weighed 35.0 g on 13 September, 1983.

The weight of juveniles depended on the time of their birth (Fig. 1). Two peaks of birth were distinguished in Lithuania: in late May – June and in August (Juškaitis, 1997c). The weight dynamics curves in separate juvenile age groups had slightly different characteristics (Fig. 1). Early born juveniles increased their weight slightly faster than late born juveniles. Before hibernation the average weight of juveniles born in May – June (26.4 g, n = 14) was similar to adult females weight ( $t = 0.57$ ;  $p = 0.571$ ), but less than adult males weight ( $t = 2.71$ ;  $p = 0.010$ ). Some of these juveniles weighed more than 30 g in early October, and the maximum registered weight was a male born in June of the same year which had reached 33.5 g on 12 October, 1985.

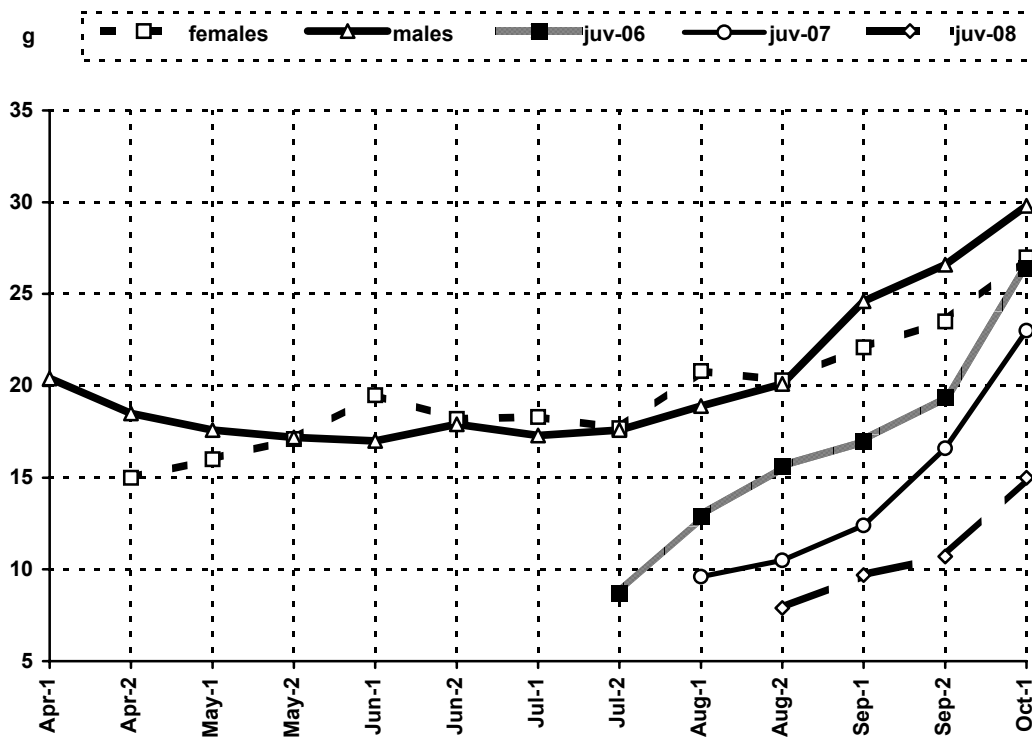


Fig. 1. Weight changes of *M. avellanarius* in separate demographic groups during the year in Lithuania.

In September the average weight of juveniles born in August was 8–9 g less than the weight of early born juveniles. By October this difference had increased to 12 g: weight gain of late born juveniles was slower. The average weight of juveniles born in August was only 15.0 g (n = 102) in early October. Only solitary individuals weighed more than 20 g, maximum registered weight was 24.8 g (weight of a female born in early August on 11 October, 1986). It is necessary to note that some of these juveniles were still active until the end of October, and their reserves of fat increased a little at this time.

The weights of juveniles born in July took up an intermediate position. In August and early September their average weight was more similar to the average weight of late born juveniles, but before hibernation they resembled early born juveniles (Fig. 1).

During hibernation *M. avellanarius* lost on average 33% of their maximum autumnal weight. In separate demographic groups this average weight loss was very similar: adult males – 33% (n=15), adult females – 35% (n=16), juveniles born in May – June – 33% (n=78). Weight loss during hibernation in late

born juveniles could be a little less. There is a tendency for dormice with higher autumnal weight to lose more weight during hibernation than lighter animals (Likhachev, 1967, our data). However it was practically impossible to estimate maximum autumnal weight of late born juveniles because their weight increased throughout October.

**Weight as a possible determinant of age**

Data on weight dynamics of *M. avellanarius* in separate demographic groups enabled us to answer a practical question: is it possible to determine the age of dormice from their weight? The presumption was made, that when the sample size is large enough dormice weights are normally distributed. In such a case,

the mean  $\pm$  2SD (standard deviation) covers 95.5% of all the sample. If weights (mean  $\pm$  2SD) do not overlap in separate age groups, it is possible to assert that weight is a sufficient criterion to separate dormice into different age groups.

Analysis showed that the use of weight to estimate the age of *M. avellanarius* is very limited because the weights of separate age groups (mean  $\pm$  2SD) overlap in many cases (Fig. 2). It is possible to identify independent early litter juveniles and adults according to their weight only from late July to mid-August. Later on in the year weight distributions of early born juveniles and adults overlap and cannot be differentiated in late August – early October. Although their average weights differ significantly ( $t = 2.71 - 8.37$ ;  $p = 0.000 - 0.010$ ), except early born juveniles and adult females in early October ( $t = 0.57$ ;  $p = 0.571$ ). The weights of juveniles born in August do not overlap with the weights of adults in September and October. In September – October, the difference between the mean weight of juveniles born in May – June and juveniles born in August was 8–12 g, although the mean  $\pm$  2SD still displayed slight overlap.

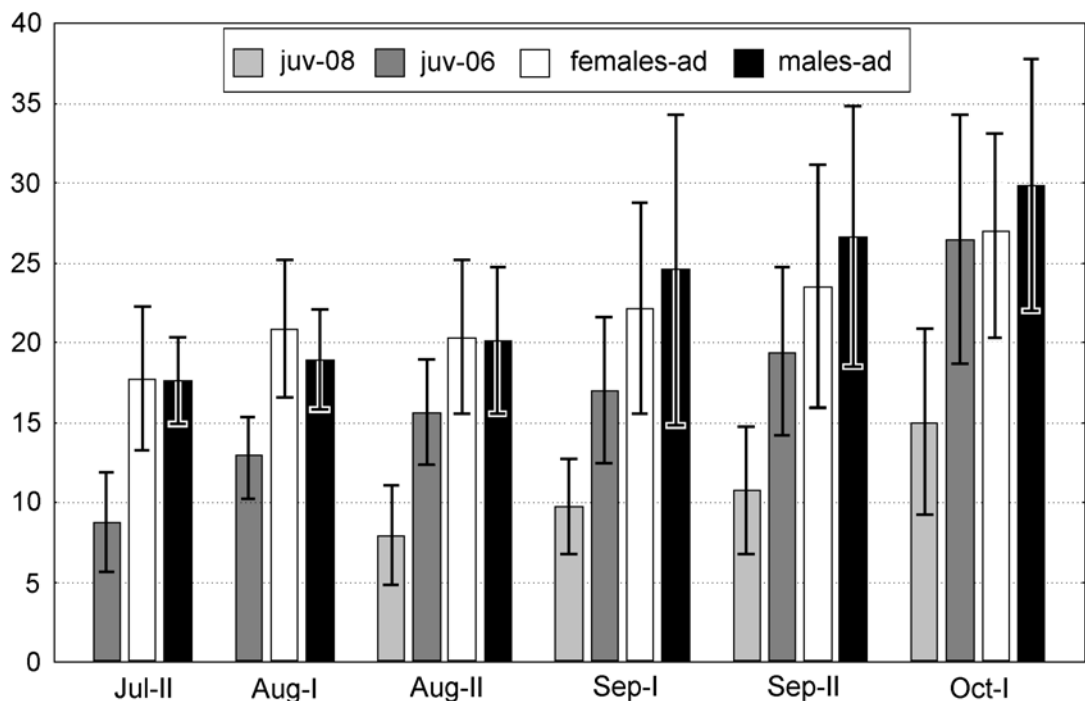


Fig. 2. Comparison of the weight (mean  $\pm$  2SD) in separate demographic groups of *M. avellanarius* in Lithuania.

In the cases where weights (mean  $\pm$  2SD) overlap, additional indicators are necessary to determine age. Fur coloration, which changes with the age, and width of tail can be used to identify independent juveniles and adults. Unfortunately, later additional criteria do not permit separation of age groups among juveniles.

#### Weight of *M. avellanarius* in different parts of its distribution area

Weight dynamics curves during the year and average weights of *M. avellanarius* in May – July (about 17 g) are rather similar in all investigated parts of its distribution area (Lithuania, Russia, Germany, Switzerland). The only known exception is Sicily, where *M. avellanarius* average weight fluctuated within very narrow limits during the year and dormice were heavier in May – July (on average 18–21 g) (M. Sara, personal communication).

Meanwhile comparisons of *M. avellanarius* weights from Lithuania with data from other parts of its distribution (Bangura, 1988; Catzefflis, 1983; Likhachev, 1967; Schulze, 1973) suggests that dormice weights in autumn before hibernation may be higher in populations in the north of its range (Lithuania, Moscow region, Tula region) than in populations in the south. Also in Lithuania *M. avellanarius* begin to increase their weight earlier than in Germany (Bangura, 1988; Schulze, 1973) or Switzerland (Catzefflis, 1983). This could be connected with longer duration of *M. avellanarius* hibernation in the northern parts of its distribution area in comparison with southern parts. In Italy, where *M. avellanarius* are active during the winter (Sara et al., 1996; Sorace et al., 1998), it is not necessary to accumulate fat reserves. So, in Sicily, the weights of dormice before winter period does not increase (M. Sara, personal communication).

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